

A REVIEW ON IMPORTANCE AND USAGE OF IMAGE SEGMENTATION TECHNIQUES APPLIED IN IMAGE PROCESSING FOR DIVERSE UTILIZATION

J. ANNE PRIYA
Ph.D RESEARCH SCHOLAR
PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS
VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN (AUTONOMOUS)
ELAYAMPALAYAM, TIRUCHENGODE-637205,
NAMAKKAL DISTRICT, TAMILNADU, INDIA

Dr.P.SUMITRA
ASSISTANT PROFESSOR

Abstract–Technology is spreading its wonders in all fields that surround the globe. Manual work has been reduced and altered with computer based. A technology that showcases its efficiency in the process of pattern recognition based on images and image enhancements is said to be digital image processing. This process have a very important position in numerous fields for the purpose of retrieving required set of information from the provided image/picture without disturbing the rest of the image. Image segmentation is one of the most important and focused part in image processing; furthermore it is the root process. The role of image segmentation is to divide or part the given image into many parts, these parts are said to be segments and from the segments the required information is extracted. The main focus of this paper is to produce and to understand the importance and usage of various image segmentation techniques followed in image processing.

Keywords –Image segmentation, Image segmentation techniques, Edge based, Region based, Thershold based.

1. INTRODUCTION

The main goal of digital image processing is to extract functional information from the given images without the help of human [1]. Disciplines like engineering, bio-medical, medical and several others fields are getting linked with technical field where images are analyzed using digital processing [2]. Segmentation is the process recognizing of object from the given image. This works in accordance with the image similarity, image discontinuity or by edge determination for exploring the information of the provided image. To process segmentation in digital image processing, various kinds of image segmentation techniques or methods are used to have the expected result. When there is few discontinuities property found in the pixel then that method is said to be boundary based, on other hand when a pixel has few similarity property then that method is known as region based. It is to be noted that the above two methods failed to produce accurate result for the segmentation [3]. Using a single segmentation method or technique will never big the exact expected result, so it is advised to use combination of image segmentation techniques. This paper describes the various image segmentation techniques that are implemented in different fields for various sets of images, it also discuss the advantages and disadvantages.

2. REVIEW OF LITERATURE

A vast range of reviews and surveys are happening in image segmentation techniques that are used for exact segmentation of image in the process of digital image.

Naveen Tokas et al. 2016 [4], “Comparison of Digital Image Segmentation Techniques- A Research Review” addresses on various techniques in image segmentation that are used for analysis of image. The paper also gives the pros and cons of the image segmentation techniques. Finally the author concludes that most of the image segmentation methods are used in all the field of technologies for the purpose of pattern, face recognition and in medical field for analyzing images.

Dilpreet Kaur and Yadwinder Kaur 2014 [5], “Various Image Segmentation Techniques: A Review” paper classifies on various image segmentation techniques with the comparison of each techniques along with their advantage and disadvantage. The authors came to a conclusion that implementing single method will not produce the exact result for every image and not all methods can produce best result for image of particular type.

Amandeep Kaur and Aayushi 2014 [6], “Image Segmentation Using Watershed Transform” paper gives away the importance and efficiency of watershed transformation method in image segmentation. The authors came to a conclusion that one of the powerful method and tool for image segmentation is watershed transform method.

Poonam Dhankhar and Neha Sahu 2013 [7], “A Review and Research of Edge Detection Techniques for Image Segmentation”, the main motive of the paper is to have a thorough study on most commonly used edge detection techniques. The study has proved that canny edge detection gives the best result. The authors came to a conclusion that canny edge detection can better serve in selected image and each edge detection are suitable in different situations.

3. SEGMENTATION TECHNIQUES

The process of segregating useful information for future use and analysis purpose, image segmentation is followed in digital image processing.

There are three main classifications in image segmentation.

- 3.1 Segmentation using Edge detection
- 3.2 Segmentation using Threshold
- 3.3 Segmentation using Region based

3.1 Segmentation using Edge detection

The fundamental step in image processing is edge detection image segmentation method. This method follows the technique to partition the image by recognizing either the pixels or the edges from the different parts that have intensity change and combine those edges of pixels for forming boundaries with closed edges [2, 5]. Amount of data from the given set of data are reduced significantly by using edge detection method in image segmentation. Then by this method essential bunch of information in regard with the object shape belongs to the screen is retained. Disconnected edges are often found and identified in this technique, but for segmenting the pixel should have closed boundaries connected. Then these disconnected boundaries are connected using several kinds of operations. This edge detection method has different techniques which are served for different purpose in different fields. Some of them are;

- 3.1.1 Kirsh edge detection, Roberts edge detection
- 3.1.2 Prewitt edge detection
- 3.1.3 Sobel Edge Detection
- 3.1.4 Marr-Hildreth edge detection
- 3.1.5 Robinson edge detection
- 3.1.6 Canny Edge Detection and
- 3.1.7 LoG edge detection.

Canny edge detection

Canny edge detection method is a very important technique that follows a procedure to locate edges by the way of segregating noise from the given image. This method is used commonly in most of the field. The edges that are detected using this method are robust. On comparison with other edge methodologies like Sobel and Roberts, this method is not inclined with noise. It may be considered superior, if the noise detector suspects the noise well.

3.2 Segmentation using Threshold

The process of dividing image into tiny segments with the coordination of gray scale or one color value to boundary definition of the provided image is highly stated as thresholding. This thresholding method uses various kinds of algorithms, namely; Global Thresholding, Adaptive Thresholding and Local Thresholding. This paper aims in sharing information on histogram with the assistance of histogram; thresholding method converts a gray scale or multi-level image in the form of binary set of image [8].

Histogram produces a graphical view of image that has varied intensity ranges or values. This technique uses T- a preset threshold value for comparing the pixel intensities which goes forward to a greatest extent either by the way of dark or white. The formula that is defined for thresholding is

$$T=T[x,y,p(x,y),f(x,y)]$$

In which x and y are the pixels of the image and the point that belong to gray scale image is P(x, y) and f(x, y). Dependency of T defines the thresholding category. When T relies on f(x, y) the threshold is said to be global and if it relies on both p(x,y) and f(x,y) then the threshold is local. Finally if it relies on x, y, P(x, y) and f(x, y) then the threshold is adaptive.


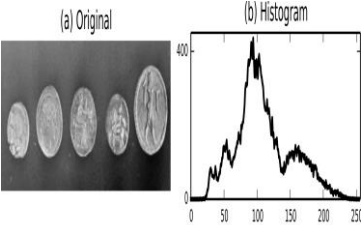
3.2 Segmentation using Region Based

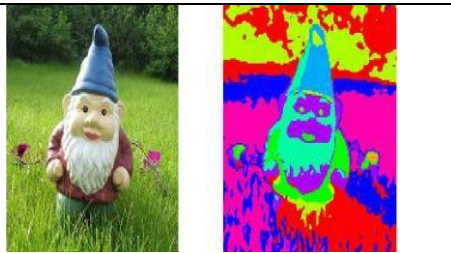
Related subset of an image or similar pixel are gathered or grouped into segments via several criteria to form an expected region of image is said to region based segmentation. [8]. According to the research findings region are said to be image that has bunch of pixels with same properties. After edge segmentation, region based segmentation is applied in most of the images. Region segmentation method is considered to be simple and resistance to noise. Region growing, splitting and merging are some process of this technique. Region that are not common in a image are split using region splitting, regions that are similar are merged using region merging and marking of light point that are stronger is done using region growing. This paper discuss on watershed region method.

Watershed Region method

Watershed method in region based technique is the process of transformation that is taken place on the grayscale image. This segmentation method can be applied to images with two regions or edges that are very close together in nature. The images in this watershed method are considered as topographic plan and the height is represented using pixel intensity [9].

EXPERIMENTAL RESULT ON SEGMENTATION TECHNIQUES – PROS AND CONS

IMAGE SEGMENTATION TECHNIQUES	DESCRIPTION	PROS	CONS
(1) Segmentation using Edge detection  1.original 2.Edge detection image	This method is purely devoted to discontinuity based detection.	Can be used for images that have improved contrast with the objects.	If there are so many edges then this method is highly not suitable and it is not recommended for detection that is wrong.
(2) Segmentation using Threshold  1.Original 2.Histogram image	For finding threshold values, this method uses histogram peaks of the given image.	The method is very simple and previous set of information is not needed.	Spatial details are not taken into account instead it is wholly peaks dependent.
(3) Segmentation using Region based	Images are partitioned by using this method in homogeneous /	Useful in implementing similarity basis and more	The method is expensive in means of memory capacity and time

 <p>1.Original 2.Region based image</p>	identical regions.	resistant to noise	duration.
---	--------------------	--------------------	-----------

CONCLUSION

This review paper has covered various kinds of image segmentation techniques with some sample images as a result of expectation. The techniques that are detailed in the paper are implemented according to the need of technologies in different fields in different combination. The paper has mainly focused in canny edge detection, histogram method under thresholding and watershed region based method. All specified techniques have unique characteristic with advantage and disadvantage and not a single technique can fulfill the need of digital image processing purpose in any field, it is only with possible combination of techniques can overwhelm the requirement.

REFERENCES

- [1] Rajesh Dass, Priyanka, Swapna Devi, "Image Segmentation Techniques", IJECT Vol.3, Issue 1, 2012.
- [2] S. Karkra ,J.B. Patel, " ATLAS BASED MEDICAL SEGMENTATION TECHNIQUES –A REVIEW ", GE- INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH, Vol. 3, Issue 5, 2015.
- [3] R. C. Gonzalez, R. E. Woods, "Digital Image Processing," 2nd Prentice-Hall Inc, 2002.
- [4] Naveen Tokas, Shruti Karkra, Manoj Kumar Pandey, "Comparison of Digital Image Segmentation Techniques- A Research Review", IJCSMC, Vol. 5, Issue 5, pp. 215 – 220, 2016.
- [5] Dilpreet Kaur, Yadwinder Kaur, "Various Image Segmentation Techniques: A Review", IJCSMC, Vol. 3, Issue 5, pp.809 – 814, 2014.
- [6] Amandeep Kaur, Aayushi, "Image Segmentation Using Watershed Transform", IJSCE, Vol. 4, Issue 1, 2014.
- [7] Poonam Dhankhar, Neha Sahu, "A Review and Research of Edge Detection Techniques for Image Segmentation", IJCSMC, Vol. 2, Issue 7, pp.86 – 92, 2013.
- [8] K.K. Singh, A. Singh, "A Study of Image Segmentation Algorithms for Different Types of Image", International Journal of Computer Science Issues, Vol. 7, Issue 5, 2010.
- [9] N.R.Pal, S.K.Pal, "A Review on Image Segmentation Techniques", Pattern Recognition, Vol. 26, No. 9, pp. 1277-1294, 1993.
- [10] H.P.Narkhede, "Review of Image Segmentation Techniques", ISSN: 2319-6386, Vol. 1, Issue 8, 2013.